CNS
Noise levels in a hospital should not exceed 30 decibels (dB). The noise levels in Intensive Care Units (ICUs) can peak at 103 dB. Sleep deprivation in ICU patients contributes to glucose intolerance, insulin resistance, activation of the hypothalamic-pituitary-adrenal axis, increase in inflammatory cytokines, and alterations in memory and cognitive function (Waye, 2013). Sleep disruption also contributes to delirium. "Delirium is independently associated with patient mortality, increased cost and length of stay, and long-term cognitive impairment" (Konkani, 2012). Sleep deprivation can cause both inattention and hallucinations (Kamdar, 2012). Noise also contributes to patient dissatisfaction. The aims of this study focused on assessing nurse perceptions of noise as well as the levels of noise in the ICU and PCU. The investigators hypothesized that nurse perceptions of noise in the ICU and PCU would be influenced by awareness of the actual levels of noise in both units across all shifts. Sharing the evidence from the obtained measures along with review of the literature via discussion, education and powerpoint format could potentially modify nurse perceptions of noise in the ICU and PCU. This study would provide baseline noise measures across shifts and noise perceptions of the elements that contribute most to the noise levels in the ICU and PCU.

### METHODS AND MATERIALS

The setting for the study was a ten-bed medical-surgical intensive care unit and a thirteen-bed progressive care unit in a midwestern community hospital. The equipment used to obtain sound measures was the BAFX Products Industry Decibel Meter. The compact meter can read between 30 dB - 130dBA, providing readings within +/- 1.5 dB. The meter had a resolution to 0.1 dB, frequency weighting of A, frequency response range of 31.5 Hz ~ 8.5Hz, sampling rate of 2x/second.

Sound measures were obtained over the course of 3 days within one week in 24 locations, on each unit at 4 different times throughout 24 hour period. Measures were obtained between 7-8am, 2-4pm, 8-10pm, and 2-4am. Regular and part time nursing staff working on each unit were recruited to take a survey to evaluate their perception of noise on each unit. Agency and support staff were excluded.

Education regarding the impact of noise on sleep disturbance and reducing noise levels was provided to staff during staff meetings in the form of a powerpoint presentation, as well as face to face communication during shift huddles. Education included the alterations in physiological functioning that can occur as a result of sleep deprivation. A poster and levels of noise flyers were also placed on the units.

A post-intervention survey was given and re-measures of noise occurred on two weeks, 3 months, and 6 months after the intervention. Data analysis consisted of descriptive statistics (mean, standard deviation) to compare noise levels across units by time periods to determine the most noisy and least noisy spaces on the units. T tests and ANOVA were used to compare for any statistical differences.

### RESULTS

#### Time

<table>
<thead>
<tr>
<th>Time</th>
<th>Mean dBA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>56.71</td>
</tr>
<tr>
<td>Post Education</td>
<td>49.5</td>
</tr>
</tbody>
</table>

F 45.56, P=0.00

The mean dBA for the ICU and PCU were significantly lower after the educational intervention.

#### One-time Readings Measured in dBA

- Bipap on highest alert alarm: 84.4 dB
- Ice machine when running: 81.0 dB
- Ventilator on highest alert alarm: 80.4 dB
- N’pump alarm: 77.9 dB
- Portable x-ray machine crossing threshold into room: 71.1 dB
- Tube feed pump alarm: 61.6 dB

### DISCUSSION

Noise levels varied across units and shifts. Hallways and rooms had lower noise than nursing stations. Noise levels went down following education and presentation of baseline noise data to the nurses. At the same time, nurses’ perceptions of factors that contributed to noise in the ICU and PCU appear to have been modified by the education and data presentation.

Nurse perceptions of each factor’s contribution to overall noise increased in the second survey which may reflect increased awareness of elements contributing to noise.

### CONCLUSIONS

Education of nursing about noise on a unit can reduce noise levels.

Evening and night dB levels were not significantly different which may reflect the 24 hour nature of critical care.

Further research is needed to discover how noise levels on a unit can be reduced to enhance quality of sleep.

**Limitations:** Fluctuating census, did not include ancillary staff, single facility study.

**References**


